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HINTS ON THE  
COLLODIO-BROMIDE PROCESS.

BY

HENRY COOPER, JUN.

London :

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Opticians to the Queen,

122 & 123, NEWGATE STREET, E.C.

1871.

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THIS delightful and fascinating process has been most undeservedly somewhat neglected, up to the present time, by the great majority of photographers. Although the capabilities of the process have been very rapidly developed by the labours of those who have experimented with it, still these labourers have been very few in number. We do not think this to be due to want of interest, or still less to inherent defects in the early working of the process, so much as it may be to the fact that it involves many points of manipulation at variance with the old established and well known methods of working usually practised.

Perhaps, another thing that has operated to retard the general introduction of the process has been the apathy shown by the photographic dealers, who have hitherto neglected to meet the special requirements of those practising it, and the consequence of this has been that those few who have taken it up have been compelled to manufacture most of the necessities (pyroxyline, collodion, &c.) for themselves.

This reproach is now happily removed, Messrs. HORNE and THORNTWHAITE having made arrangements to supply to the photographic public all the materials for working the Collodio-Bromide process; and we hope that many who have held aloof until now will give this method of preparing dry plates a fair trial.

As the Author of these "Hints" has devoted a good deal of time and care to the process, and has been fortunate enough to introduce one or two modifications which he believes to be of

value, he is induced to give as concise a statement as possible of that method of working with which he has succeeded best, in the hope that, by so doing, he may remove the few stumbling-blocks that are likely to impede the progress of one commencing the process as an entirely new thing.

By following the instructions here given, it is believed that success will attend the efforts of those who *carefully* carry out the various manipulations described.

To avoid confusion, it is thought advisable not to turn aside to describe any other means whereby the same end may be reached; but simply to state in what manner a plate is to be treated, from the bare glass up to the varnished negative, so that the beginner may have a reasonable hope of obtaining the great object of his desire—a good printing negative—and we can confidently say, that in no other photographic process at present in use is success so likely to follow moderate skill and care, as in the Collodio-Bromide. To those commencing photography itself, we can cordially recommend it as simple, certain, and clean.

We need not go into the history of its origin and development, as it would occupy more space than we can spare; but must simply record the fact that the first *practical* method was introduced by Messrs. Sayce and Bolton in 1864.

As our readers are probably already aware, the Collodio-Bromide process dispenses with the nitrate of silver bath, by forming in the collodion itself an “emulsion” of the sensitive silver salt. Of the iodide, bromide, and chloride of silver, the first is unavailable, as it will not remain suspended in the collodion, and the third is much too insensitive to employ alone. The bromide, either alone or used in combination with a small proportion of chloride, is the silver salt that we have to use in our collodion.

A special collodion is required, absolutely free from any trace of an iodide, as the iodide of silver behaves in a very dog-in-the-manger kind of way; it not only will not remain suspended in the collodion itself, but it will not allow the bromide to do so if it be present.

Before commencing the preparation of the collodion, the yellow light of the dark room must be carefully examined. A light in which wet plates can be easily worked, might cause fogging in Collodio-Bromide ones, owing to the greater length of time that the latter are exposed to its influence during prepara-

tion. The light cannot be considered *safe* unless a wet plate, half of which has been exposed near to the yellow window for full five minutes, remain, after developing and fixing, quite unmarked by the action of the light. This is a severe test, but not too strong a one, as we know of several instances in which mysterious fog in dry plates has been traced to a deficiency in the character of the yellow light of the dark room.

With the collodion supplied by Messrs. Horne and Thornthwaite, directions are given for mixing the plain bromised collodion and the alcoholic solution of nitrate of silver, to form the sensitive emulsion of collodio-bromide of silver.

For the benefit of those who may desire to prepare their own collodion, for the sake of experiment, we give the formula that has already been published in a paper read before the Photographic Society of London, in January, 1871. For the *reasons* for mixing the collodion in the way recommended, we must refer the reader to this paper, where he will find some remarks on the subject which we have not space to include here.

#### THE COLLODION.

Ether sp. gr. .730.	. . . . .	4 fl. ozs.
Alcohol sp. gr. .805	. . . . .	2 "
Bromide of cadmium, anhydrous	. . . . .	40 grs.
Bromide of ammonium	. . . . .	24 grs.
Powdery pyroxyline	. . . . .	from 40 to 50 grs.

Dissolve the bromides in the alcohol, add the ether, and lastly the pyroxyline, and stand aside to settle.

#### TO SENSITIZE THE COLLODION.\*

Measure 12 fl. drs. of the above collodion into a four-oz. bottle. Weigh 32 grs. of pure nitrate of silver, finely powdered, and without losing a morsel, convey it, by means of a strip of paper folded lengthwise, to the bottom of a clean test-tube. Pour upon it 3 fl. drs. of alcohol sp. gr. .825 or .830 (about 60° O.P.), and raise it to the boiling point over a spirit-lamp, occasionally shaking the tube round and round so as to disperse the particles of silver throughout the spirit.

When cooled down, pour off the alcohol into the 12 drs. of

\* Directions for sensitizing the Collodion supplied by HORNE AND THORNTHWAITE, will be found at p. 15, as also the prices of accurately divided Tubes, which are essential to ensure success in this process.

collodion and agitate the mixture. Now boil the remainder of the nitrate of silver in the test-tube with 3 fl. drs. more of the alcohol, and add it to the collodion. After standing for a few hours, 12 more fl. drs. of plain bromised collodion are to be added, and the mixture well shaken. When required for use, 10 grs. of nitrate of silver are to be dissolved in 2 drs. of alcohol, and added to the emulsion, which, after standing at rest for about an hour, is ready for the immediate preparation of the plates. No filtering is required. Of course it is not at all necessary to fully sensitize the whole of the mixture at once. One-half, for instance, may be taken, and a proper proportion of silver and alcohol added.

*In measuring or weighing the bromised collodion and nitrate of silver great care must be taken to be very exact.*

The proportions of each are so arranged that, when the collodio-bromide emulsion is fully sensitized, a small quantity of bromide remains unconverted, or, in other words, there is not quite so much silver as would entirely decompose the bromides in the collodion. This arrangement is most important, and hence the need of perfect exactitude, as if any trace of free nitrate of silver be present in the collodion, fogging will inevitably ensue. On the other hand, if the quantity of nitrate of silver used be *less* than that ordered, the films will be very insensitive.

A *substratum* of some kind is very essential. It is not *absolutely* necessary, but all those who desire perfect plates, with ease and certainty of working, will not fail to use it. Dilute albumen, or a solution of India-rubber in chloroform may be used, according to the taste of the operator.

**Albumen substratum.**—The prepared albumen\* for this purpose is made as follows :—Take

Albumen	.	.	.	.	.	.	8 ozs.
Water	.	.	.	.	.	.	1 oz.
Glacial Acetic Acid	.	.	.	.	.	.	24 drops.

Mix the acid with the water, then add it to the albumen ; stir together with a glass rod for one minute ; then, after resting

\* HORNE AND THORNTWHAITE supply the Prepared Albumen in 4 oz. bottles, which merely requires diluting with 16 times its bulk of water for use.

one hour, strain through coarse muslin, and to the strained liquid add half a dram of the strongest liquor ammonia.

This prepared albumen will keep good for at least twelve months if kept closely corked, and is very clear and bright when the mixture of albumen, water, and acetic acid is merely mixed together, but if beaten up in the usual manner, an opalescent liquid is obtained.

One ounce of this "Prepared Albumen" is mixed with 16 ozs. of water to form the dilute albumen, which must be filtered into a bottle for use.

If the glass be new, rub it over on both sides with dilute hydrochloric acid (acid, 1 part; water, 2 parts). A piece of rag fastened to the end of a bit of stick will answer well, and it can be thrown away each time. As the glasses are rubbed with the acid, place them in a deep dish or pan, and when all are in, fill up with water. Now remove them singly, and with the help of a perfectly clean sponge, which must be kept exclusively for this purpose, thoroughly wash them under a tap and immerse them in a pan of clean water.

The stream from the tap should flow in an even manner over the surface of the glass; if it appear greasy it is a proof that it is not *clean*, and it must be placed on one side for further treatment. A little common whitening and water, well rubbed on with a piece of rag, followed by washing and second treatment with the acid as just described, will generally clean these obstinate glasses.

If old varnished negatives are to be used up, the film must be removed by immersing the plates in a hot solution of washing soda until it will easily leave the glass; and after the soda has been rinsed away, the plates must be treated with the acid as if they were new glass.

The acid alone will usually suffice to remove unvarnished films, if the plates be allowed to remain for a few minutes after the application of the acid, and before rinsing.

The plates being cleaned and immersed in water, are ready to receive the albumen.

Filter some of the dilute albumen into a measure, letting the end of the funnel touch the side, so as to avoid forming froth or air-bubbles.

Now remove one of the plates from the pan of water, being careful not to let the fingers come in contact with the side to be

coated, slightly drain, and then pour a sufficient quantity of the filtered albumen on one end, placing the lip of the measure almost in contact with the glass, to avoid splashing. Incline the plate so as to cause the albumen to flow in an even wave to the other end. Rock the plate for a few seconds, then tilt it up to let the excess of albumen run down the sink, and put it in a rack to drain; or place it, with the coated side inclined to the wall, with the lower edge on blotting paper, in a cupboard quite free from dust or draught.

If a rack be used, a piece of blotting paper must be so arranged as just to touch the lowest corner of the plates.

When quite dry, the albumenized plates may be stored away for future use. As they will keep any length of time, quite a stock may be prepared at once. It is almost impossible to avoid getting some of the albumen on the back of the plate; this is, however, of no consequence, as there is no nitrate bath to contaminate.

Some persons dry and polish the glasses before albumenizing, but besides the extra amount of labour, it is much more difficult to get the albumen to flow over the plate than when it is wet. Although coating the plates may seem a lengthy affair in description, it is not so in practice. In fact, there is a great saving of trouble as compared with the ordinary operation of plate cleaning. Instead of the laborious and often vexatious operation of wiping and polishing the glasses, they have simply to be flowed with the albumen and reared up on end to dry. In both cases the cleaning and washing is the same, and we would advise anyone who is alarmed at the albumenizing, to compare the time it takes him to coat and stand up to dry one dozen plates, and the time occupied in wiping and dry-polishing another dozen.

If the plates are kept for any length of time before using, they must be dusted just before collodionizing; but if they are used as soon as dry, this is unnecessary.

Should there be any doubt as to which is the albumenized side, breathing upon the plate will immediately decide the question. The moisture will perceptibly condense on the bare glass, but not on the coated side.

**India-rubber substratum.**—Dissolve 2 grs. of pure India-rubber in 2 fl. ozs. of chloroform, and filter through thin filtering paper, or a plug of cotton wool.

Too much of this solution must not be made at once, as it sometimes loses its good qualities by keeping. A strong solution of the rubber in chloroform may, however, be kept in stock, and diluted with fresh chloroform until the strength is one gr. to the oz.

Clean, dry, polish and dust the glass as for the wet process. Flow the India-rubber solution over the right side in the same manner as collodion; it dries immediately. Coat with the collodion at once, before any dust settles, as the India-rubber film must not on any account be touched with a dusting brush.

If no substratum at all be used, a brush, charged with a 2 gr. solution of India-rubber in chloroform or benzole, must be drawn round the edge of the plate, forming a border of India-rubber film about a  $\frac{1}{4}$ -inch wide. This is to prevent the water getting under the collodion film in the washing.

The collodio-bromide having been full sensitized as already described, is poured over the plate precisely in the same way as when coating with ordinary bromo-iodised collodion, only as the suspended bromide of silver renders the collodion rather more viscid, a little extra care and dexterity is required to secure a perfectly even film. This is important, as if lumpy ridges or markings exist, they are sure to show in the finished picture.

If, after preparing a few plates, the collodion should become too thick to manage, it may be thinned with a very little ether; not *much*, as the film should be as creamy and opaque as it is possible to get it.

The collodion being well set, the plate is immersed in a dipping bath of filtered water, and moved up and down for a few seconds. As soon as the greasy lines have disappeared, it is removed to a second bath of water, and another plate is coated with collodion and immersed in the first.

Number one plate must now be placed in a vessel of water capable of holding a number of plates. The Author has a specially designed washing trough, which is very convenient. A deep porcelain dish will do if a more suitable vessel is not at hand, the plates being laid side by side at the bottom. A little silver hook, or suitable piece of bone or horn, should be provided wherewith to raise them.

The dish should be covered to exclude dust, &c. When as many plates are in as the dish will hold, they must be allowed to

soak for about one hour. If less time be given, the films will be not quite so sensitive.

During this time another batch may be prepared, and placed to soak in a second dish; the preservative may be prepared, &c.

**The Preservative, or Organifier.\***—Prepare a sufficient quantity of the following solution, allowing one-half oz. to each 8 by 5 plate to be prepared \*—

Finest Gum Arabic, in powder . . .	15 grs.
Tannin . . . . .	4 „
White Sugar . . . . .	4 „
Distilled Water . . . . .	1 fl. oz.

This must be used the same day as mixed. When dissolved, filter it carefully into a clean measure, adopting the same precautions as when filtering the dilute albumen, to avoid air-bubbles. Take plate No. 1 out of the vessel of water in which it has soaked one hour, attach a pneumatic holder to the back, and swill the surface with distilled or clean filtered water to wash away any little particles of dust or dirt that may have settled on it.

Drain for a few seconds, and then gently pour some of the preservative on one corner (the lip of the measure nearly touching the film), and tilt the plate so that as the gum solution flows over it, the water on the surface may be driven before it. Well rock the plate, and then throw off the solution. Now pour on a sufficient quantity more, about 2 drams for an 8 by 5 plate, and after allowing it to soak into the film for one minute, pour it off, and rear the plate up on end to dry. This second dose of preservative, if poured into a measure, instead of down the sink, will answer for the first application to the next plate.

If the operator is not fortunate enough to possess a specially designed drying box, the prepared plates must be placed in a cupboard, or large box, with their lower edges resting upon several thicknesses of fresh filtering paper. They must, of course, be carefully screened from draughts, dust and white light. When all the plates are in, the cupboard door should not be again opened until the plates are dry, as a draught of air passing over them when half dry is almost sure to cause a mark on the film. The time taken in drying will necessarily vary, according to cir-

\* Supplied by HORNE and THORNTWHAITE, ready weighed up in packets. See page 16.

cumstances ; but if the plates are prepared in the evening, they ought to be quite ready for removal the following morning. A temperature of from 60 to 80 degrees is the best for drying. If a cupboard, or large box, be used, it is a very good plan to well dry it, by means of hot-water bottles, or hot flat-irons, before the first plate is introduced. If artificial heat is required to dry the plates, the hot-water bottles should not be placed in the cupboard until the last plate is in. This precaution is necessary for the reason mentioned above ; that if the door be opened when any of the plates are half-dry, markings will ensue.

Owing to the peculiar bluish tint of the film, a backing of some non-actinic colour is indispensable to prevent blurring or halation. When the plates are thoroughly dry, they must be coated at the back with a suitable composition. To save trouble, properly prepared pigment is now to be obtained of Messrs. HORNE and THORNTHWAITE in collapsible tubes.

A sufficient quantity is to be evenly brushed over the back, and the plate again reared up to dry. We have often used the following mixture :—Dissolve 200 grs. of dextrine in half an oz. of water ; add 20 drops of glycerine, and one drop of carbolic acid ; then well mix it with 1,000 grs. of moist burnt sienna ground in water. Apply with a flat camel's-hair brush.

The prepared plates are now ready for the camera. The exposure may be deferred for a long time, as they will keep good for some months if thoroughly dried, and packed up in such a manner as to protect them from the atmosphere.

Dr. Norris' method, or a modification of it, is the most convenient and satisfactory, when the plates have to be kept any length of time, or when they have to be packed for travelling.

The best mode with which we are acquainted is one that has been severely tested and found very efficacious, and which we will endeavour to describe.

Some narrow strips of cardboard must be first cut,  $\frac{1}{8}$ th of an inch wide and about 2 inches long. These are to be glued or gummed on to silk ribbon  $\frac{3}{8}$ ths of an inch wide, one touching each edge so that there is a space of  $\frac{1}{8}$ th of an inch between them. It will readily be perceived that we can fold these strips of ribbon and card over the ends of a plate, in such a manner that one strip of card is on the film side and the other on the back, the uncovered ribbon between them allowing for the thickness of the glass.

To pack the plates, lay one of them on the table, film side uppermost, having previously placed a rather long piece of string underneath ; then take another, and folding one of the prepared pieces of card and ribbon over each end of it, lay it film side down upon the other ; the strips of card at each end effectually preventing contact.

Now lay another plate, film side up, upon those already on the table. This third plate will not require the ribbon, as No. 2 is protected by the strips already placed upon it.

No 4 is to be armed in the same manner as No. 2, and placed, face downwards, on No. 3. This order is to be followed until a sufficient number of plates are laid one on the top of the other, face to face, and back to back. From 6 to 12 is a convenient number for a single packet. If double backs are used for the exposures, it is a good plan to make each packet of the same number as the backs will hold.

By means of the string that was passed under the plates in the first instance, tie them together. Now wrap them in a sheet of thin paper ; or, what is far preferable, very thin sheet gutta-percha ; then, in tin or lead-foil ; and, lastly, in stout brown paper. By adopting this plan, the plates are most effectually shielded from light and air ; and, moreover, occupy the smallest possible space. A few trials will be necessary to determine the amount of exposure required. From twice to four times as long as a very sensitive wet plate is usually the limit. Be sure to give long enough. A little over-exposure may easily be rectified in the development, but under-exposure cannot be so satisfactorily disguised. There is, nevertheless, considerable latitude allowable in the matter of exposure. By suitable treatment in development, a plate that has been exposed one minute, and one that has had, perhaps, half as long again, can be made to give an equal result.

But the pleasure, ease, and celerity with which a properly timed plate can be developed should make every one most anxious to hit the right exposure, and not to give either more or less. We would advise the jotting down in a pocket-book of each exposure that is given with data of lens, stop, subject and kind of light, and the result of the development.

These notes will be found most valuable as guides to subsequent exposures.

## THE DEVELOPMENT.

The following solutions are required :—

A.	Pyrogallic Acid . .	3 grs.	Water, 1 oz.		
B.	Bromide Ammonium .	10 "	" "		
C.	Carbonate Ammonia .	30 "	" "		
N.	Nitrate of Silver .	30 "	" "		
P.	{ Pyrogallic Acid . .	1½ "	}	"	"
	{ Citric Acid . .	1½ "			
	{ Acetic Acid . .	10 drops.			

A. must be freshly mixed. P. will keep a few days, the others a long time. B. C. and N. should be in dropping bottles, and these bottles should if possible be of different sizes, or so marked that they can be easily distinguished.

We, ourselves, have a 1 oz. dropping bottle for solution B., and one holding nearly 2 ozs. for C., both also marked with a large printed label. The silver solution, bottle N., has a broad band of black varnish drawn right round it. Solutions A. and P. should also be in different shaped bottles. We insist thus strongly on this point, as any mistake between these solutions would, probably, prove fatal to the negative under treatment.

The exposed plate being removed from the dark slide, we must first wash off the backing. A sponge wrung out of water will easily effect this. Care must be taken that none of the pigment gets on the film. The sponge should not be too wet, and a few trials will enable the operator to remove the colouring matter in a very few seconds.

Attach the plate to a pneumatic holder (one that will stand with the plate in a horizontal position, if procurable), and flood the surface with dilute alcohol, alcohol and water equal parts, and return the excess to the bottle.

Wash with water from a tap or jug until the greasy lines disappear, and the water flows evenly over the surface.

For an 8 by 5 plate take half an ounce of plain pyro solution A., and mix it with 2 drops of bro. ammonium B. in a perfectly clean developing cup. Pour it over the film, and after working it about for a few seconds, return it to the cup.

Now add 2 drops of carb. ammonia solution C., well mix, and pour it over the plate. The image will now begin to appear. If the high lights make their appearance in a few seconds, the

details gradually following, we may conclude that the plate received the proper exposure. In this case a few more drops of C. are added to the developer, and the plate is to be gently rocked about to keep the solution in motion. When the effect of the developer seems to cease it may be washed off, and a fresh supply mixed as before and applied to the plate. If the plate appears to be a trifle over-exposed at this stage, it is better not to apply this second dose, but to proceed at once to the intensification. If, on the other hand, it seems to be a little wanting in detail, the bromide solution B. may be reduced to one drop, or even altogether omitted, and the carbonate solution C. be increased to four drops. Sometimes the plate may be brought up to printing intensity by this second dose of developer alone, without any intensification with silver whatever, but unless the requisite amount of force is readily obtained, we must forego this and resort to silver. The plate must not be *forced* too much with the alkaline developer, or with the *desired* intensity we shall probably obtain *undesired* fog. The details being fully out, we must thoroughly wash off the alkaline pyro, and flood the plate with some of solution P. Allow it to soak in, and then pour it off down the sink. Now mix  $\frac{1}{2}$  oz. of P. with 2 drops of N. in a clean developing cup, and apply it to the plate. The image rapidly deepens in intensity, and as soon as the requisite depth is obtained the plate must be well washed. We must here call attention to a little "dodge" well worth knowing. It depends upon the fact of the different effect produced by keeping the solution of pyro and silver in motion, or holding it quite quiet. If we have abundance of detail, and only wish to increase the brilliancy of the high lights, we must rock the plate about so as to keep the intensifier in rapid motion; but if we want to increase the value of the details, we must allow the plate to remain quite still in a horizontal position while the solution is on it.

To return to the primary development. If, on the application of the alkaline pyro the image starts out *at once*, it is a proof that the plate was over-exposed; however, we must try and save it. At once wash off the developer, and mix a second dose with 4 or 5 drops of B. and 2 of C.; or add 2 or 3 drops of B. to the first lot, and again apply to the plate. Should the amount of over-exposure be greater than can be remedied by this treatment, we must proceed at once to intensify with acid pyro

and silver, after well washing away the first dose of alkaline developer.

If, instead of over-exposure, the image is a very long time making its appearance, showing that the exposure given was too short, we must gently and patiently coax out the details. Reduce the quantity of bromide, and increase the carbonate in the developer, and allow it to act for some time. Do not give it up in despair too soon, particularly if the subject be one that it is desirable to keep; but continue the application of the alkaline pyro. If the plate be very refractory it may be removed from the pneumatic holder, placed upon a levelling stand, and allowed to remain with the developer upon it whilst another plate is proceeded with.

After finishing the intensification of a plate, the pneumatic holder must be well washed, before commencing to develop another.

As we have already said, considerable latitude is allowable in the exposure, although all the operations of development are much simplified if just the right time be given. By adjusting the proportions of alkaline carbonate and of the bromide of ammonium in the developing solution of plain pyro, we can overcome the defects of *slight* over or under-exposure with comparative ease, and by proceeding to extreme measures we can even remedy greater deficiencies.

We must bear in mind that the bromide retards development and prevents fog, whilst the alkali increases the reducing power of the pyrogallic acid. If we increase the alkali to too great an extent we produce fog, particularly if we, at the same time, remove the restraining power of the bromide.

When an under-exposed plate has been "coaxed" in the development, it will sometimes be found to be slightly veiled, not *fogged*, in the bad sense of the word; but this will not generally interfere with the printing qualities of the negative.

After washing away the developer, the plate must be fixed in weak hyposulphite of soda. 1 part of hypo. to about 30 of water, without previously exposing it to white light, which is apt to fog an unfixed collodio-bromide plate.

After washing and drying, the negative must be carefully examined. If there be any doubt as to the intensity; and, at first, one is apt to be deceived by the *colour* of the image, it will be advisable to print a proof before varnishing. This can be

done without scratching the film, if moderate care be taken in placing the paper on the negative. If it be found to be wanting in intensity it must be wetted, flooded with iodide potassium,  $\frac{1}{2}$  gr., iodine,  $\frac{1}{2}$  gr., water, 1 oz., again washed, and then intensified with acid pyro and silver.

Before concluding, we must explain the way to successfully use up the residue remaining after preparing a batch of plates. The emulsion in its fully sensitized state will not remain in good working order more than two or three days; but the addition of plain bromised collodion will make it keep for weeks.

After preparing the plates, place the residual emulsion in a clean bottle, and add to it some plain bromised collodion (say 5 drams of HORNE and THORNTHWAITE's to each four ounces of residues). After well shaking, it may be placed on one side, carefully protected from white light. After the preparation of the next batch of plates the residue may be likewise added to it. When these residues have sufficiently accumulated enough nitrate of silver solution must be added to fully sensitize the plain bromised collodion previously added, and the emulsion may then be used to prepare a batch of plates. If 5 drams of HORNE and THORNTHWAITE's collodion were mixed with it, 3 drams of their silver solution must be added.

As the resensitizing will have been done only once, the plates prepared with this emulsion will not differ greatly from those previously made. The residues must not on any account be mixed with the stock of partially sensitized collodion.

We believe that the foregoing "hints," and they pretend to be nothing more, will be found to contain all the necessary instructions to enable the reader who has had no previous acquaintance with the process, to produce, after a very few trials, negatives by "Collodio-Bromide" that shall give satisfaction both to himself and to critical friends.

Should, however, unexpected difficulties arise, the Author will have great pleasure in giving all the assistance in his power, through the medium of the Photographic Press.

HENRY COOPER, JUN.

*February, 1871.*

## COLLODION FOR THE COLLODIO-BROMIDE PROCESS.

HORNE and THORNTHWAITE have great pleasure in stating that they have succeeded in arranging the excellent formula of Mr. HENRY COOPER, Jun. for the Collodio-Bromide process, so that the Nitrate of Silver is supplied in an Alcoholic Solution of such a strength, that when mixed, according to the directions given below, it forms an emulsion of which each ingredient is in its exact proportion so needful to ensure successful results.

### DIRECTIONS FOR MIXING HORNE AND THORNTHWAITE'S COLLODIO-BROMIDE.

To 10 drams of the Plain Bromized Collodion, add 8 drams of the Nitrate of Silver Solution. Shake well together, and allow the emulsion thus formed to remain about 12 hours (longer in cold than in warm weather), then add 10 drams more plain Bromized Collodion. Again shake, and let the mixture stand until required. In this state it will keep good for some weeks in summer, and some months in winter. To fully sensitize for use, add to the above mixture 4 drams more of the Solution of Nitrate of Silver; shake well together; and after being allowed to rest one hour, it will be ready for use.

*The above mixture must be carefully excluded from white light*

### PRICE OF HORNE AND THORNTHWAITE'S COLLODIO-BROMIDE WITH ALCOHOLIC SILVER SENSITIZER.

	£	s.	d.
4 ounces in two solutions in stoppered bottles	0	3	6
8       "                       "                       "                       "	0	6	0
16       "                       "                       "                       "	0	11	6

**Accurately Graduated Tubes** intended for use in measuring the Collodion and its sensitizer, the ordinary measures not being accurate enough for this purpose. Price, per pair, 2s. 6d.

**Prepared Albumen** keeping good for months (1 oz. to 16 ozs. water, forms the dilute albumen used as a preliminary coating). In 4 oz. bottles, 1s. 6d. each.

**Backing for Collodio-Bromide Plates**, to prevent halation. In collapsible tubes, ready for use, 1s. each.

## CHEMICALS, &c., FOR THE COLLODIO-BROMIDE PROCESS.

		<i>s. d.</i>
Acetic Acid . . . . .	3d. oz. per lb.	3 0
Alcohol '805 . . . . .	" "	6 0
" '830 . . . . .	" "	4 0
Ammonia . . . . .	per oz.	0 1
Bromide Ammonium . . . . .	" "	2 0
" Cadmium, anhydrous . . . . .	" "	2 6
Carbonate Ammonia . . . . .	" "	0 1
Citric Acid . . . . .	" "	0 3
Cotton Wool . . . . .	" "	0 4
Distilled Water . . . . .	per gallon	0 6
Ether '730 . . . . .	per lb.	6 6
Hyposulphite Soda . . . . .	" "	0 4
Nitrate Silver . . . . .	per oz.	3 8
Prepared Albumen . . . . .	per 4oz. bottle	1 6
Pyroxyline . . . . .	per oz.	2 6
Pyrogallic Acid . . . . .	" "	4 0
Tannin . . . . .	" "	0 9
Varnish . . . . .	per 4oz. bottle	1 6

## ACCESSORIES.

**Filtering Paper**, 1s. per quire, or in packets of 100 for 2in. funnel, 7d., for 3in. funnel, 9d., and 4in. funnel, 1s.

**Gutta Percha** in thin Sheets, 1s. per oz.

**Tin Foil** in sheets 11in. by 14in., 2d. each.

**Silver Wire Hook** for lifting sensitive plates, 9d. each.

**Pneumatic Plate Holders**, 3s. 6d. each.

Packets of Pyrogallic Acid ready weighed up, to form, when dissolved in 4 ozs. of distilled water, the solution **A** (page 11) 3d. each.

Packets of Preservative Powder, to form, when dissolved in 4 ozs. of water, the solution described at page 8, 3d. each.

The whole of the materials needed to test this process, including 4 ozs. of the Collodion and its Sensitizer, sent on receipt of Post-office Order for 10s. 6d., or with a pair of accurately Graduated Tubes, 13s.

Also every article required in Photography may be obtained of

## HORNE & THORNTHWAITE,

Opticians, Philosophical and Photographic Instrument Makers in

Ordinary to Her Majesty,

122 & 123, NEWGATE STREET, LONDON, E.C.

*Catalogues Free by Post.*



## HORNE AND THORNTHWAITES FIVE GUINEA ASTRONOMICAL TELESCOPE.

This Telescope, although so low in price, is well made in all its parts, and quite equal in definition to those formerly sold at a much higher cost.

The body of the Telescope is of polished brass, with pillar and claw stand; rackwork adjustment to eye-piece; achromatic object glass, 3 inches in diameter, 2.85 in CLEAR aperture, and 3 feet focus; one astronomical eye-piece with sun cap, and one day eye-piece. The whole enclosed in a polished pine wood case, with lock and key.

This Instrument will, on a fine clear day, show the time by a church clock 12 miles distant, and clearly define the moons and belts of Jupiter, the rings of Saturn, and many of the double stars, and the object glass will bear a magnifying power of 130 diameters.

The object glass of the above Telescope is guaranteed of good average quality; but as many may be desirous of purchasing one of extra quality, we are prepared to supply for **SEVEN GUINEAS** a Telescope as above described, with the addition of a "finder," and furnished with a carefully selected object glass, which is guaranteed, if used under favourable circumstances, and by the educated eye, to bear a magnifying power of 180, and to show the companion of the Polar star.

For **TEN GUINEAS** we supply a Telescope, with "finder," and with an *extra fine* object glass, capable of bearing a magnifying power of 250 diameters.

For large size Telescopes and accessories, see our Telescope List, sent free for two stamps.

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## SPECTACLES.

MESSRS. HORNE & THORNTHWAITES, being anxious that especial attention should be paid to the selection of Spectacles supplied by them, have great pleasure in announcing that Mr. WILLIAM ACKLAND, Surgeon (Registered under the Medical Act), may be consulted in all matters relative to Spectacles, daily, from 10 till 5; Saturdays, 10 till 1, at their establishment, 123, Newgate Street.

Mr. ACKLAND has, for the last 18 years, paid especial attention to the optical means necessary to remedy defective sight, and has also lately brought to perfection his improved form of Optometer used in adapting Spectacles, which is confidently asserted to be the only instrument known, giving an exact knowledge of the foci and adjustment of the eye, and thus enabling even weak and defective sight to be supplied with suitable Spectacles.

Sufferers from defective sight should read Ackland's "**HINTS ON SPECTACLES**," sent post free for seven stamps.